MEMO

State of Idaho
Department of Water Resources
322 E Front Street, P.O. Box 83720, Boise, Idaho 83720-0098
Phone: (208) 287-4800 Fax: (208) 287-6700

Date: March 9, 2012

To: Monica Van Bussum – Water Supply Bank Coordinator, State Office

From: Sean Vincent SV - Hydrology Section Manager, State Office

cc: Craig Tesch, State Office
Rick Raymondi, State Office
Steve Lester, Western Regional Office

Subject: Assessment of Ark Properties LLC Water Supply Bank rental application

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Per your request, I've reviewed your memo describing the subject Water Supply Bank rental application. The salient points of my assessment are as follows:

1. There is a possibility of injuring a water user whenever a groundwater point of diversion (POD) is relocated. However, in this case, the relocation is not permanent and it involves movement of two PODs from an area within the Mountain Home Ground Water Management Area (MHGWMA) to an area that is outside the management area (Figure 1).

2. The cold-water aquifer system is comprised of river and lake sediments and basalt. Alluvial sands and gravels generally are the production zones for wells.

3. Because the common groundwater resource is both heterogeneous and not well-characterized, the hydrologic impact of the temporary transfer cannot be predicted with confidence. Conceptually, movement of PODs from inside the MHGWMA to an area just outside the boundary is potentially beneficial to the aquifer system within the management area. On the other hand, the new PODs are actually closer to the Cinder Cone Critical Ground Water Area (~5 miles) than the old PODs (~7 miles). As concluded in the April 14, 2010 review of a modeling analysis that was performed in support of water right transfer #73811 (Attachment 1), movement of PODs closer to the boundary of critical area is a concern because it potentially exacerbates hydrologic conditions within the critical area.

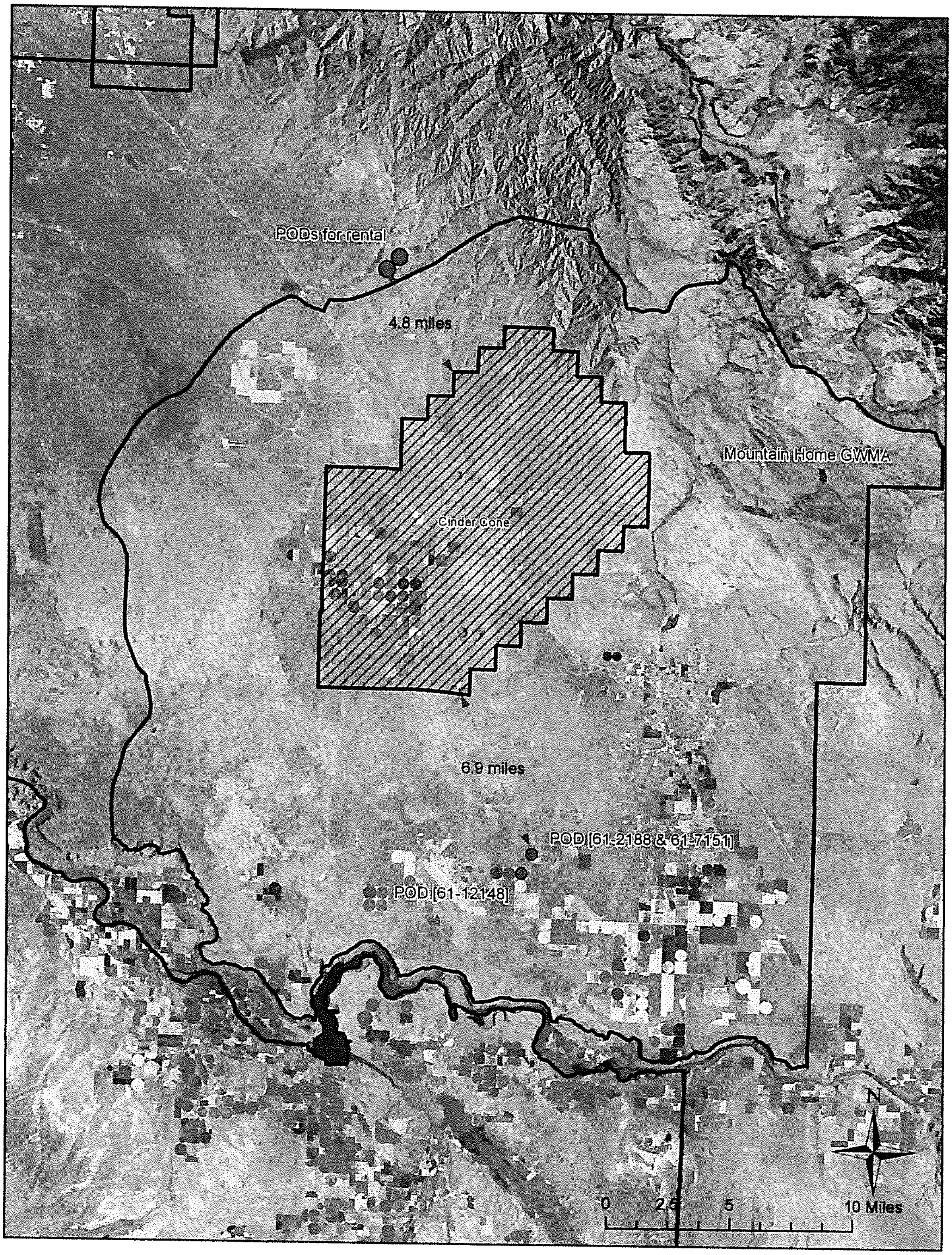

Figure 1 – Location of PODs in relation to the Mountain Home Ground Water Management Area and the Cinder Cone Critical Ground Water Area.

Welll ID Number	PermitID	Metal Tag Number	Owner	WellUse	Production (gpm)	StaticWater (ft bls)	Open Interval (ft bls)	Total Depth (feet)	Construction Date
1	843245	D0047442	BO NEILSEN	Domestic	30	252	315-320	330	11/7/2006
2	725434		RONALD D AMBROSE	Domestic	40	205	255-256	256	3/13/1992
3	722626		LEO ZUMMERS	Domestic	20	92	117-200	200	9/4/1988
4	815531	D0031310	LARRY FARNSWORTH	Domestic	60	69	146-147	147	5/21/2004
5	843964	D0047651	ARK PROPERTIES LLC	Irrigation	1700	229	432-622	690	1/23/2007
6	851081	D0052697	ARK PROPERTIES LLC	Irrigation	2000	270	602-792	809	6/12/2008
7	851510	D0048369	MAYFIELD TOWNSITE LLC	Domestic	20	145	190-200	200	6/10/2008
8	862443	D0060212	STATE OF IDAHO	Monitoring	17	183	420-440	500	11/15/2011
9	862552	D0060214	STATE OF IDAHO	Monitoring	0	62	55-65	100	11/17/2011

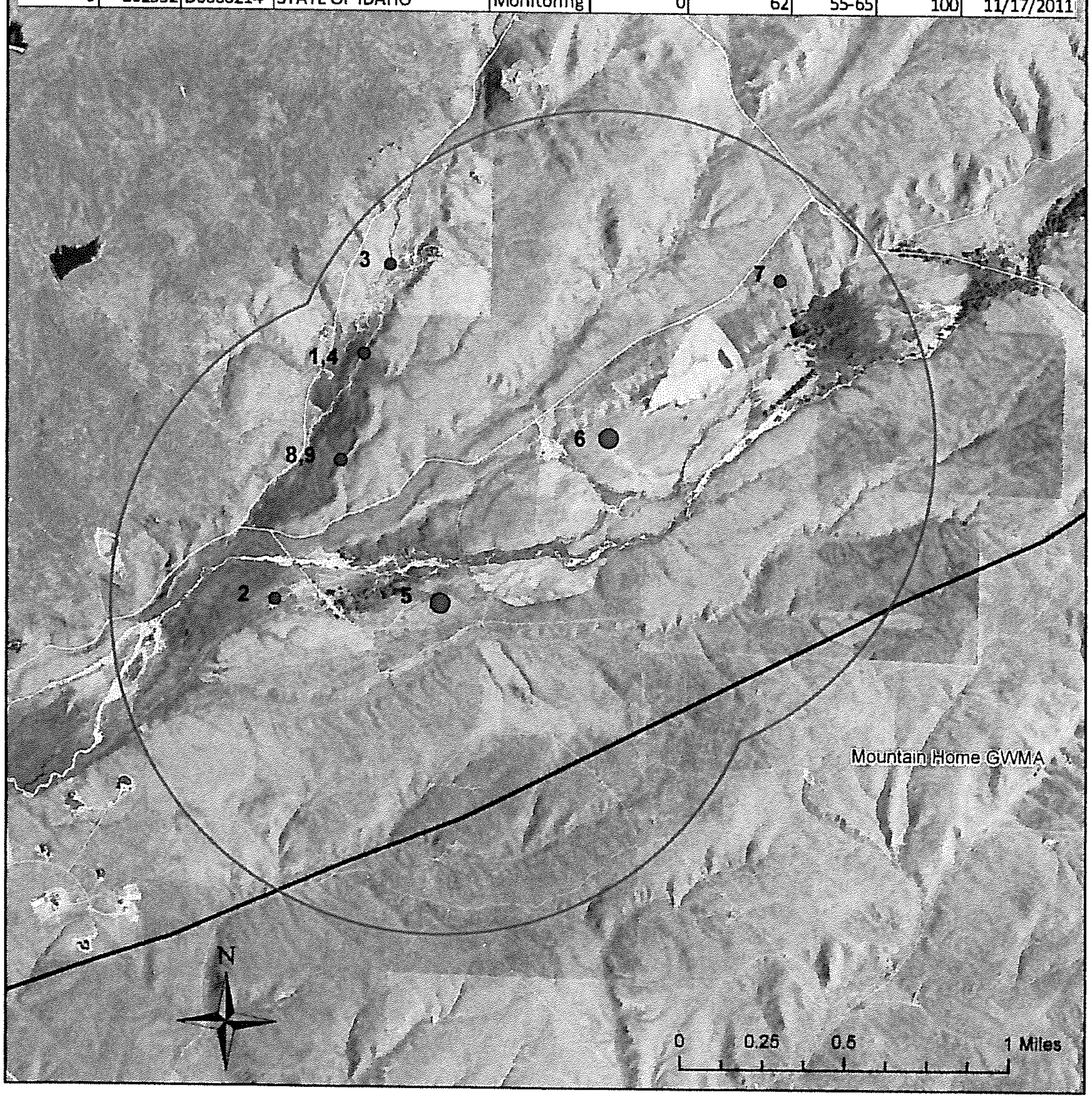

Figure 2 – Wells within a 1-mile radius of the proposed irrigation PODs.

Attachment 1

April 14, 2010 Technical Review of Groundwater Modeling Analysis in Support of Water Right Transfer #73811

MEMO

State of Idaho
Department of Water Resources
322 E Front Street, P.O. Box 83720, Boise, Idaho 83720-0098
Phone: (208) 287-4800 Fax: (208) 287-6700

Date: April 14, 2010

To: Steve Lester

From: Craig Tesch and Sean Vincent CT SV

cc: Rick Raymondi

Subject: Technical Review of Groundwater Modeling in Support of Idaho Water Company Water Right Transfer #73811

Introduction

The purpose of this memorandum is to document our review of the December 28, 2009, groundwater modeling analysis that was prepared by Brockway Engineering, PLLC in support of Idaho Water Company (IWC) water right transfer #73811. In accordance with your request, this review has been conducted to answer the following questions:

1) Does the consultant information show an adequate, sustainable ground water supply at the proposed site?
2) What impacts would be expected to other wells in the area?
3) What impacts to Mountain Home Ground Water Management Area (GWMA) and Cinder Cone Critical Ground Water Area (CGWA) would be expected?
4) How does consultant information fit with other information previously provided to and analyzed by IDWR for the general area in question?

Summary

The subject transfer proposes to split six groundwater irrigation rights and create a new permissible place of use (POU) with a maximum diversion rate of 5.56 cubic feet per second (cfs) and an annual volume limitation of 1,476 acre-feet. The transfer involves moving rights from the current POU approximately seven miles southeast of the Cinder Cone CGWA to a proposed POU approximately 0.5 miles northwest of the Cinder Cone CGWA; both locations are within the larger Mountain Home GWMA. The existing points of diversion (PODs) are located southwest of Mountain Home and east of the

Mountain Home Air Force Base at T04S R06E Sections 17, 18, 19, and 20 in Elmore County. The proposed POD are approximately 0.5 miles south off the Simco Road exit of I-84, at T01S R04E Sections 14, 23, and 24 in Elmore County (Figure 1).

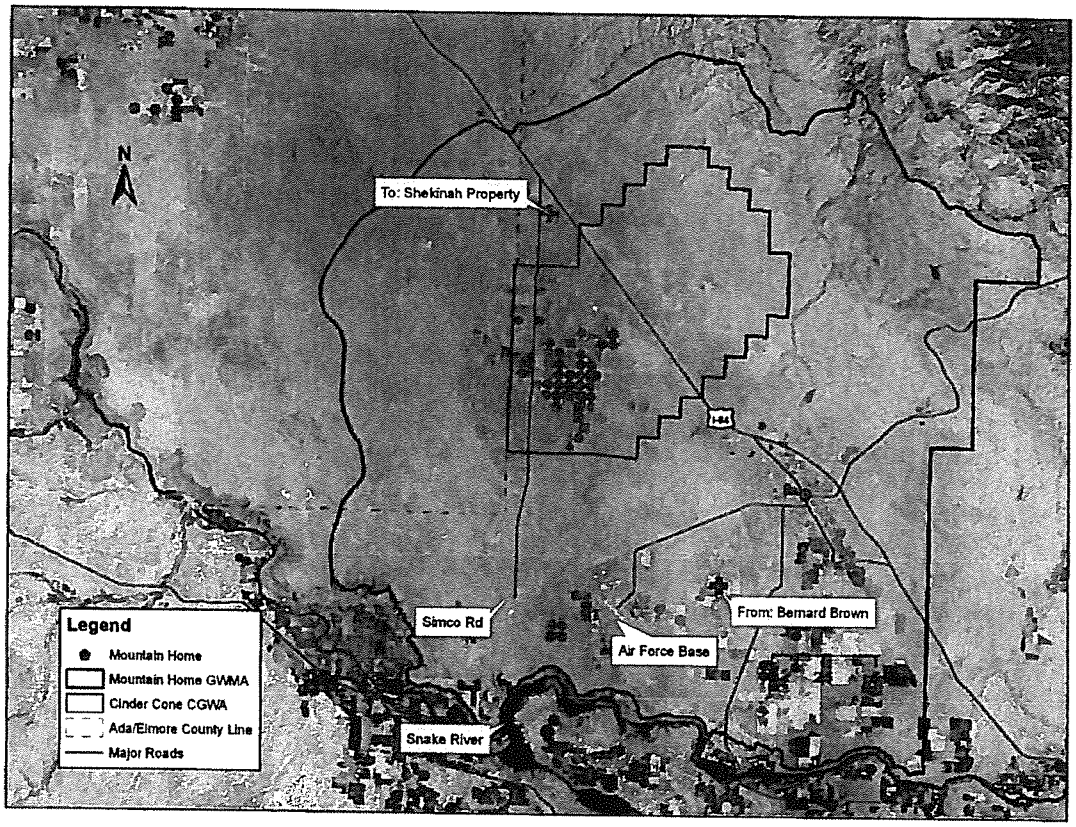

Figure 1. Map showing To (Shekinah Property) and From (Bernard Brown) POD locations for the proposed IWC transfer.

The original transfer application was submitted by IWC on behalf of Shekinah Industries to IDWR on December 7, 2006. IDWR issued a letter on November 5, 2008, requesting additional information related to potential hydrologic impacts, monitoring, and mitigation. Shekinah Industries retained Brockway Engineering to develop a numerical groundwater model (referred to herein as the Brockway Engineering model) to address IDWR questions. The report titled "Shekinah Industries Groundwater Model Development and Transfer Scenario Runs" (Powell, 2009) is the focus of this technical review and contains the following information:

- General area description
- Model development and calibration
- Aquifer characterization
- Water budget analysis

- Transfer evaluation
- Data deficiency and refinement

Hydrogeology

The western Snake River Plain (WSRP) is a deep structural depression that is filled with sedimentary and volcanic rocks of Tertiary and Quaternary age that is bounded by northwest trending faults (Newton, 1991). Mountains composed of granitic and volcanic rocks surround the plain on the northeast and southwest (Figure 2). Powell (2009) describes two aquifers beneath the study area: (1) a shallow, perched, alluvial aquifer with limited extent around the city of Mountain Home, and (2) a regional aquifer composed primarily of basalt layers of the Bruneau formation of the Idaho Group.

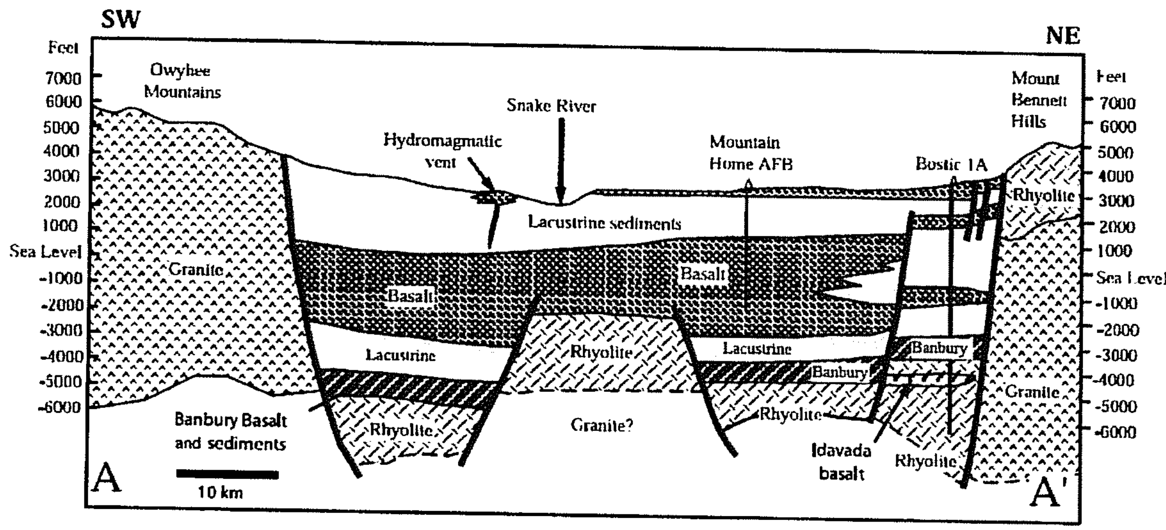

Figure 2. Geologic cross-section through the WSRP (Shervais, 2002).

According to the modeling consultant "Numerous well drilling reports indicated layers of alluvium material below rock layers throughout the model domain" (Powell, 2009, p. 13). While this description is indicative of the large-scale geology and formations of the Idaho Group, it is important to note that variability exists on a local scale. For example, well logs in T01S R04E Sections 22 and 23 (Eisman and Williams Pipeline wells) show several layers of volcanics intermixed and underlain by sediments; however, a well log in T01S R04E Section 15 (adjacent to Sections 14 and 22) shows 467 feet (ft) of sediments from land surface to completed depth with no volcanics present. Data deficiencies related to geology, hydrostratigraphy, groundwater elevations, and aquifer extent exist in this portion of the WSRP and are the focus of ongoing studies by IDWR.

A two-aquifer system (shallow perched and deep regional) is described in the Mountain Home area by Norton (1982). Location maps indicate that neither the current nor the proposed POD reside within the boundaries of the perched aquifer system mapped by Young (1977) near Mountain Home. However, a review of driller's logs for wells in and around the proposed POD (T01S R04E Section 23 and its eight adjacent sections) indicates other shallow groundwater systems can exist locally in the region. A driller's log for a well in T01S R04E Section 24 (Western Livestock well) reports 176 ft of sediments from land surface to completed depth with a static water level of 45 feet below ground surface (ft-bgs). The remaining driller's logs report regional aquifer static water levels ranging from approximately 300 to 500 ft-bgs.

Groundwater flow is generally south/southwest towards the Snake River based on contouring of spring 2000 water level data that were collected by IDWR (Figure 3). Although water levels have changed, the shape and spacing of the contours are similar to those presented in Figure 3 of Newton (1991), which is a groundwater contour map based on water levels collected in the spring of 1980. The contours from the Newton (1991) map were used as the calibration target for the steady-state Brockway Engineering model.

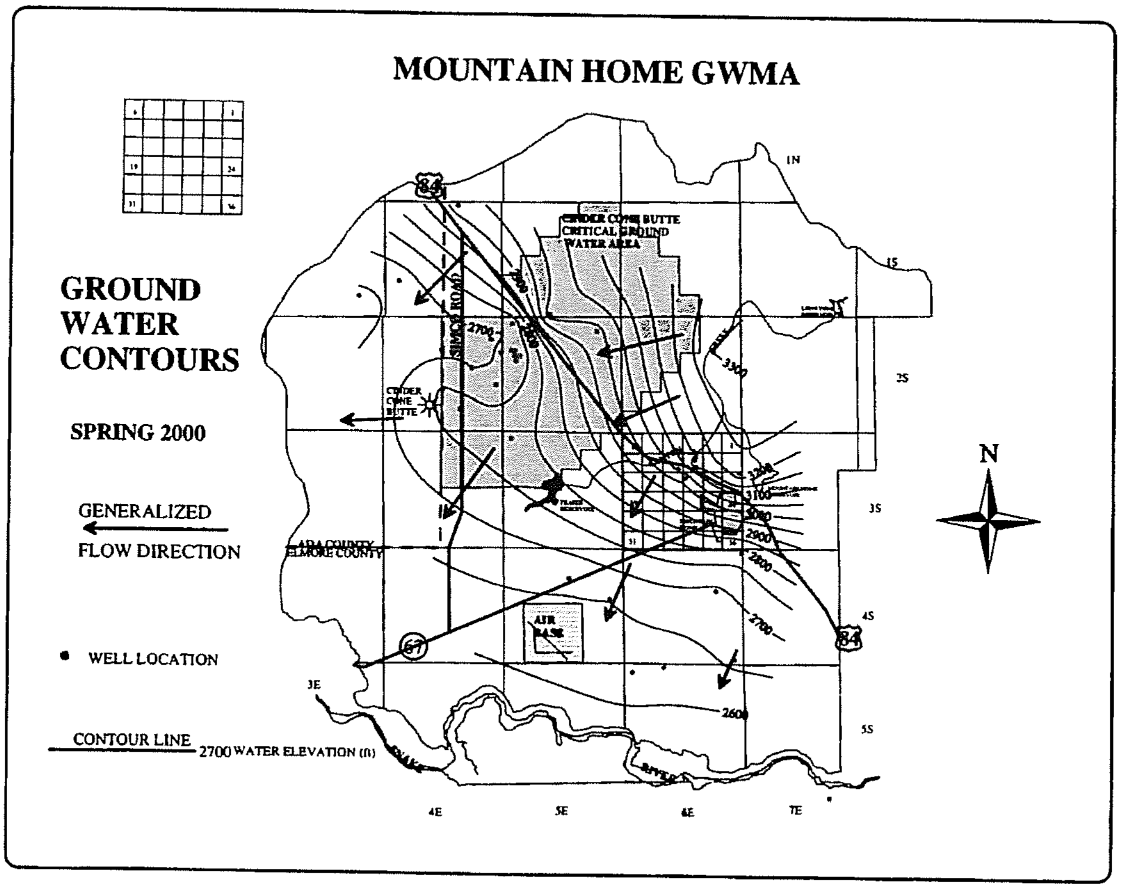

Figure 3. Spring 2000 water level contours for the Mountain Home groundwater monitoring network (Harrington, 2001).

IDWR has maintained a groundwater level monitoring network on the Mountain Home Plateau since 1960. The network includes wells that are located within both the Mountain Home GWMA and the Cinder Cone CGWA. Water level declines since that time resulted in the establishment of the Cinder Cone CGWA on May 7, 1981, and the Mountain Home GWMA on November 9, 1982. According to Powell (2009), "steady aquifer declines have been recorded in the Mountain Home area for about 35 years" (p. 6).

Water levels measurements taken in 19 wells during the spring between 1983 and 2009 were analyzed by IDWR to determine differences between historic and current water levels (Figure 4). Thirteen of the 19 wells (68%) had lower water levels in the spring of 2009 than were measured in the spring of 1983. The water level declines in those wells range from approximately 0 to 80 feet. Declines greater than 50 feet were observed in five wells located in the southwest portion of the Cinder Cone CGWA.

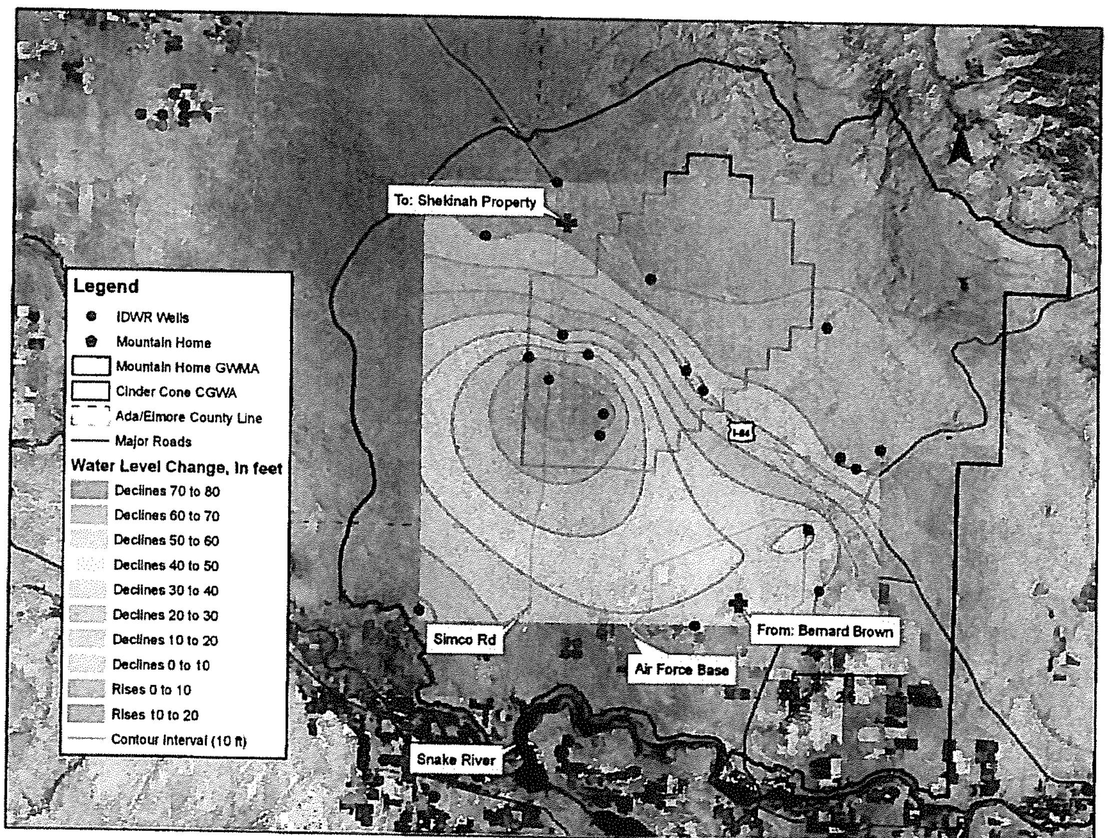

Figure 4. Groundwater level change from spring 1983 to spring 2009 within the IDWR Mountain Home monitoring network.

Five of the six wells in which water level increases were observed are located northeast of interstate I-84. The current PODs are located in an area with declines of 30 to 40 ft over the last 26 years, while the proposed PODs are in an area in which the water level has risen from 0 to 10 ft. The cause of differing trends is currently unknown; there is significant uncertainty about aquifer behavior in this area due to a general lack of hydrogeologic data.

Northwest-trending faults mapped in the area (Bond, 1978) may serve as partial barriers to flow and contribute to the difference in trends between wells north/northeast of I-84 and those south/southwest of I-84. Additionally, irrigation development near Simco Road in the southwestern portion of the CGWA likely is affecting the distribution of water level declines. Studies performed as part of the IDWR Treasure Valley Comprehensive Aquifer Management Planning (CAMP) program will provide hydrologic information to facilitate a more rigorous evaluation of the factors affecting water levels in the GWMA and CGWA.

Groundwater Model

Overview

As mentioned earlier, Shekinah Industries retained Brockway Engineering to develop a numerical groundwater flow model for the area. The Brockway Engineering model is based loosely on the Newton (1991) model created for the Regional Aquifer-System Analysis (RASA) Program of the U.S. Geological Survey (USGS). Subarea boundaries of the Newton model were used as guides and the resulting grid consisted of 152 columns by 116 rows with 15,710 active cells and a uniform cell size of ¼ mile by ¼ mile (Powell, 2009, Figure 8). The Brockway Engineering model was developed as a steady-state model with one layer, similar to Newton's layer 1, with a bottom elevation 500 feet below the water table. Calibrated hydraulic conductivities are similar to those used in the Newton model and range from 4 ft/day to 53 ft/day (Powell, 2009, Figure 14).

A specified flux boundary was defined on the northeast edge of the model domain and the flux was estimated using Darcy's law. Head-dependent river cells were used to represent the Snake River along the southwest boundary of the model. Constant heads were assigned to the southeast and northwest model boundaries based on 1980 groundwater elevation contours from Newton (1991) and then converted to specified flow boundaries after calibration. Another set of groundwater contours was developed by Brockway Engineering based on more recent water level data from USGS observation wells and IDWR well logs; however, it was determined that the new data were unreliable and the contours from Newton (1991) were used instead.

While it is reasonable to use a published USGS potentiometric surface map for assignment of constant head boundaries, the water table has declined in a majority of the Mountain Home GWMA since the 1980 contours were developed. As identified by Allan Wylie in his review of the model (Attachment A), assuming steady-state conditions while acknowledging the system has been declining in many areas of the model domain for decades is difficult to justify and causes large predictive uncertainty.

It is unclear why contours were used for calibration instead of the water levels from which they were developed. More commonly, groundwater models are calibrated to actual water levels and goodness of fit is calculated by comparing simulated heads to measured water levels. The statement in the modeling report that "no current published groundwater contours were available for the region" (Powell, 2009, p. 23) does not explain the rationale for deciding to not use recent water level data for model calibration. In fact, a groundwater contour map could have been created from the 2000 water level data (see Figure 3) or from the 2009 data.

Water Balance

A review of Brockway Engineering's water balance (Table 1) for the calibrated, steady-state model was conducted as part of this request. However, because the model is based on the assumption of equilibrium, the model water budget is not very useful for evaluating adequacy and sustainability issues in an area that has experienced large water level declines over time. On the other hand, the aquifer does supply the annual volume to the current water right, and the transfer request involves moving the POD rather than increasing the rate of extraction.

Table 1. Water balance for the steady-state Brockway Engineering model.

	IN (ft^3/day)	OUT (ft^3/day)	TOTAL (ft^3/day)
Northeast Underflow	9,165,000	0	9,165,000
Constant Head	5,142,000	-12,102,000	-6,960,000
Snake River	73,000	-20,489,000	-20,416,000
Transfer Well	0	-176,000	-176,000
ET – Sagebrush	0	-69,060,000	-69,060,000
Irrigation	21,395,000	0	21,395,000
Precipitation	83,500,000	0	83,500,000
Ground Water Extraction	0	-16,880,000	-16,880,000
Municipal Extraction	0	-568,000	-568,000
Total	119,275,000	-119,275,000	0

According to the modeling report, the volumetric precipitation rate in Table 1 (83,500,000 ft^3/day) represents the average annual value for the period 1971-2000. This rate is equivalent to 13.4 in/yr if evenly distributed over the area that is represented by the 15,710 active cells in the model. Since we were not provided with a shapefile of the model boundaries, it is not possible to verify the computed precipitation rate, but it is higher than the average annual value cited on page 4 of the modeling report (9.98 inches). It is possible that the 3.4 in/yr discrepancy can be accounted for based on location differences and/or the use of different periods of record.

The ET value in Table 1 represents an area-adjusted average annual value that was developed using ET data from the University of Idaho Kimberly Research and Extension Center (http://www.kimberly.uidaho.edu/ETIdaho). The ET value for alfalfa was assumed for areas of agricultural land use, and the ET value for sagebrush was assumed for rangeland areas. It's worth noting that the rate of precipitation exceeds the rate of evapotranspiration by 14,440,000 ft^3/day. This differential is equivalent to 167 ft^3/sec (cfs) and represents 2.3 in/yr of recharge if uniformly distributed over the active model area. This recharge rate as a fraction of the total precipitation is 17%, which is an order of magnitude higher than the estimate for the western Snake Plain as a whole (2%) that was developed for the USGS model (Newton, 1991, p. G16).

The modeled Snake River contributions in Table 1 were compared to reach gain estimates based on stream gage data for the Snake River. In 2008, the USGS measured an average annual rate of 6,561 cfs at the gage below CJ Strike Reservoir and 6,788 cfs at the downstream Murphy gage; this represents a river gain of 227 cfs compared to 236 cfs in the water balance for the model. While the two numbers compare favorably, the water balance estimate (236 cfs) represents Snake River contributions from the north side of the river only. This suggests that the modeled discharge to the Snake River is overestimated by the amount of water contributed from the south side; however, the contribution from the south side of the river is unknown.

Recharge from irrigated acreage (Powell, 2009, Figure 12) was obtained by analyzing IDWR water right shape files and aerial photography, and assuming a uniform crop and irrigation efficiency. Alfalfa was chosen as the crop, and an irrigation efficiency of 75% was assumed, both of which are reasonable. The result in Table 1 is inclusive of surface water and groundwater irrigation sources and is a reasonable approach to calculating the irrigation recharge component of the water balance.

Groundwater extraction estimates for irrigated lands were calculated by dividing the precipitation deficit amount by an irrigation efficiency of 75%, and then applying them to irrigated acreage according to IDWR water right files (Powell, 2009, Figure 13).

Municipal extractions were determined by obtaining records directly from water system managers. Domestic well extractions were not included in the model as Brockway Engineering assumed nearly all water was returned to the aquifer through septic systems.

The transfer well discharge value of 176,000 ft^3/day in Table 1 represents the requested annual volume limitation of 1,476 acre-feet. The maximum diversion rate of 5.56 cfs is 3.52 cfs (304,351 ft^3/day) greater than the average rate based on the annual volume limit (2.04 cfs). Greater drawdown than predicted in the Brockway Engineering analysis could be expected from using the maximum rate of withdrawal instead of the average rate.

Brockway Engineering reports two underflow values, a hand calculated rate and a model calibrated rate, the latter of which is reported in Table 1. The hand calculated external flux, or underflow, was determined using Darcy's law and water table gradients from the 1980 contours published by Newton (1991). Brockway Engineering calculated an underflow rate of 9,224,090 ft^3/day using a gradient of 0.0085, hydraulic conductivity of 12 ft/day, aquifer thickness of 500 ft, and length of 34.31 miles. This value is equivalent to 2,250 acre-ft/yr/mile. The model calibrated underflow was reported as 9,165,000 ft^3/day.

Brockway Engineering compares their hand calculated underflow to previous values of 800 acre-ft/yr/mile and 270 acre-ft/yr/mile calculated by SPF Consulting and IDWR, respectively, for the review of a previous water right application for groundwater development in the area (IDWR, 2009a). Powell (2009) states the underflow value estimated by IDWR is "substantially low when compared to the published aquifer properties" (p. 17). Brockway Engineering's calculated underflow rate exceeds the SPF estimate of 800 af/yr/mile, which was developed by assuming 100% of the difference between precipitation and evapotranspiration is recharge. The IDWR underflow estimate that was developed as part of the evaluation of the Nevid water right application (270 acre-ft/yr/mile) is also based upon water budget calculations that were developed using precipitation data, measurements of surface channel seepage, and estimates of evapotranspiration (IDWR, 2009a, Finding of Fact #23).

Underflow estimates for the various methods using a boundary length of 34.31 miles include:

- Brockway (2,250 af/yr/mile): 9,224,090 ft^3/day (77,290 af/yr or 106.8 cfs)
- SPF (800 af/yr/mile): 3,275,562 ft^3/day (27,448 af/yr or 37.9 cfs)
- IDWR I-84 memo[1] (393 af/yr/mi): 1,598,400 ft^3/day (13,394 af/yr or 18.5 cfs)
- IDWR Nevid (270 af/yr/mile): 1,105,502 ft^3/day (9,263 af/yr or 12.8 cfs)

[1]An underflow estimate of 55.4 cfs for a similar area of interest (subarea 4 of the Newton model) was derived by IDWR in a previous staff memo (IDWR, 2009b) for all three layers of the Newton model. Dividing by three results in an underflow value of 18.5 cfs (1,598,400 ft^3/day) for one layer.

Brockway Engineering's method to calculate underflow using Darcy's law differs from the water balance method used by SPF and IDWR to evaluate water right applications of other area developments (e.g., SPF 2009, IDWR 2009a, and IDWR 2009b). Uncertainty in the input parameters can lead to large variations in Darcy flow calculations (Table 2). The hand calculated hydraulic conductivity used by Brockway Engineering, 12 ft/day, represents an average specific capacity derived from 14 pump tests conducted in the flat-gradient portion of the area; however, the gradient itself appears to be calculated from steep contours at the basin boundary (Powell, 2009, Figure 8). The modeled hydraulic conductivity is 4 ft/day along a portion of the underflow boundary, and 10 ft/day along the remainder of the boundary (Powell, 2009, Figure 14). The use of a higher hydraulic conductivity (12 ft/day) to calculate underflow than was used to represent the aquifer next to the underflow model boundary will increase the underflow estimate. Although data are lacking, consistency in geographic locations should be maintained when calculating flow by using either (a) a gradient from the same flat-gradient portion as the pump tests or (b) using a hydraulic conductivity from the same steep contour area as the gradient.

A sensitivity analysis was performed where underflow was calculated using various hydraulic conductivity values from the Brockway Engineering model and hydraulic gradients from the 1980 water level contour map in Newton (1991). Modeled hydraulic conductivities of 4 ft/day and 10 ft/day at the underflow boundary of the Brockway Engineering model were analyzed along with the reported average of 12 ft/day used to estimate the external flux at the northeast boundary (Powell, p. 16). Gradients used ranged from 0.0085 representative of the steep contour area near the boundary to 0.0025 in the relatively flat portion near the center of the WSRP. Calculated underflow in Table 2 ranged from 223 af/yr/mi to 2,263 af/yr/mi, demonstrating the uncertainty in the estimation of underflow using Darcy's law.

Table 2. Underflow as a function of hydraulic conductivity and gradient. Total area = 34.31 miles * 500 foot aquifer thickness. Model underflow = 9,165,000 ft^3/day (2,238 af/yr/mi - Table 1, Powell, 2009).

Hydraulic Conductivity (ft/day)	Contours Used (ft)	Distance Between Contours (miles)	Gradient (ft/ft)	Darcy Flow (af/yr/mi)	Darcy Flow (ft^3/day)	Difference from Brockway Value (ft^3/day)
12	3300-2850	10	0.0085	2,263	9,263,700	-98,700
12	3200-2500	20	0.0066	1,760	7,205,100	1,959,900
12	2900-2700	15	0.0025	670	2,744,800	6,420,200
10	3300-2850	10	0.0085	1,885	7,719,750	1,445,250
10	3200-2500	20	0.0066	1,466	6,004,250	3,160,750
10	2900-2700	15	0.0025	559	2,287,333	6,877,667
4	3300-2850	10	0.0085	754	3,087,900	6,077,100
4	3200-2500	20	0.0066	587	2,401,700	6,763,300
4	2900-2700	15	0.0025	223	914,933	8,250,067

Technical Review Questions

Responses to each of the four questions posed in the introduction and included in the request for analysis are presented below.

Question 1

- Does the consultant information show an adequate, sustainable ground water supply at the proposed site?

The consultant provides little site-specific data to help evaluate whether the supply at the proposed location is adequate and sustainable. No drilling or aquifer testing was performed as part of this transfer application and the potential hydrologic impacts of nearby faults were not considered in the modeling analysis. Although driller's logs were presented in the modeling report (Powell, 2009, Appendix A), there was little geologic interpretation and no attempt was made to validate the conceptual model of a 500-foot thick aquifer. The modeling report does, however, present a summary table which presents hydraulic conductivity estimates that the consultant developed using specific capacity data from area wells (Powell, 2009, Appendix B).

Conclusions by the consultant about the sustainability of the water resource are instead based on the modeling simulation, the model water budget, and historical water level trends for area wells. As previously expressed, the value of the steady-state model and the significance of conclusions based upon the model water budget are diminished by the fact that the model is predicated on the assumptions that the aquifer system is, and has been, in equilibrium since the calibration dataset was collected in 1980. The equilibrium assumption is contrasted by the statement, "*Steady aquifer declines have been recorded in the Mountain Home area for about 35 years*" (Powell, 2009, p. 6).

The consultant is correct in noting that the proposed POU is in an area of more stable water levels than the current place of use (Powell, 2009, p. 6). Because the steady-state model can't be used to simulate historical water level declines, however, the model cannot be used to help to understand the non-uniform distribution of water level declines. The fact that the model is not capable of simulating historical water level declines that resulted in the creation of the Mountain Home GWMA and Cinder Cone CGWA makes model-based conclusions uncertain.

While the equilibrium assumption decreases the significance of model-based conclusions, modeling is not required to assess regional impacts because the aquifer system already supplies the transfer volume to the current water right. Assuming the water is produced from hydraulically connected portions of the same flow system, there should be no impacts to the overall water budget at a regional scale. Localized impacts are described in our responses to Questions 2 and 3 below.

<u>Question 2</u>

- What impacts would be expected to other wells in the area?

Drawdown impacts were predicted with the Brockway Engineering model assuming a steady rate of extraction equal to the volume limit (1,476 af/yr). A contour map of the pumping-induced drawdown (Figure 18, Powell, 2009) indicates approximately four to five feet of drawdown at a distance of one mile and approximately two feet at a distance of five miles (the map does not have a scale so distances necessarily are approximate).

Based on their steady-state simulation, the consultant concludes "The model results in a maximum aquifer decline of over 11 feet at the proposed diversion." (Powell, 2009, p. 27). Even if the model is representative of the physical system at a regional scale, the prediction of the localized water level impact cannot be taken at face value since an individual model cell is much larger (¼ mile by ¼ mile) than a well and all of the discharge was assumed to be pumped from a single well in the simulation. Using the methodology described in Prickett and Lonnquist (1971, p. 61), the additional drawdown that could be expected at the well is 29.5 feet (assuming a well diameter of 12 inches, pumping rate of 1,476 acre-ft/yr (914 gal/min), saturated aquifer thickness of 500 feet, and a hydraulic conductivity in the vicinity of the well of 12 ft/day).

The total drawdown would be approximately 40 feet (11 feet of modeled drawdown plus 29.5 feet to correct for the model grid) if the well were fully penetrating and 100% efficient. For comparison, the drawdown at the conclusion of a 70-hour aquifer test that was performed on the Dale Payne well was 90 feet after pumping at a constant rate of 1,700 gal/min with a similar hydraulic conductivity estimate (17.6 ft/day) and a somewhat greater saturated interval (770 feet). The model results should not be used alone as an indicator of near-pumping well impacts without acknowledging the impacts of grid cell size.

Since recharge from precipitation is part of the water budget it is assumed the aquifer system was modeled using the unconfined layer option (LAYCON = 1) in Modflow. However, if the confined layer option (LAYCON = 0) was used instead, there would theoretically be more drawdown than was predicted because pumping would cause a decrease in the saturated thickness. This possibility cannot be evaluated because the model documentation does not describe which layer option was selected.

Greater drawdown would be predicted using the maximum diversion rate instead of the volume limit resulting in greater impacts than what is currently reported. Additionally, the model does not simulate the fault zone that Bond (1978) mapped as roughly paralleling Interstate 84. Fault zones potentially serve as partial flow barriers resulting in increased drawdown from pumping and limiting hydraulic communication with the recharge area to the north.

<u>Question 3</u>

- What impacts to Mountain Home Ground Water Management Area and Cinder Cone Critical Ground Water Area would be expected?

After reviewing historical water level declines (Figure 4) and drawdown contours developed by the Brockway Engineering model, IDWR has no reason to disagree with the following statements in the Powell (2009) report:

<u>Mountain Home GWMA</u>

"The proposed transfer will have a positive effect in the Mountain Home groundwater management area near the city of Mountain Home." (p. 29)

"Considering that the proposed transfer involves valid water rights, these water rights currently have impacts on the groundwater management area and the critical groundwater area." (p.25)

"Since the existing water right already has an impact on the groundwater management area and critical ground water area (Figure 19), we are relocating that impact to portions of the critical ground water area that have seen stable or increasing groundwater levels (Figure 6) and reducing the demand in the Mountain Home region where the groundwater elevations have been steadily declining (Figure 4).

Cinder Cone Butte CGWA

"The proposed transfer will also have a negative impact on the Cinder Cone Butte Critical Groundwater Area." (p. 29)

"Groundwater elevations in the vicinity of the proposed point of diversion will be negatively affected by the transfer...Groundwater elevations were shown to decrease within the Cinder Cone Butte Critical Groundwater Area." (p. 25)

The aquifer does supply the annual volume to the current water right, but it is important to note that the current POU is approximately seven miles from the Cinder Cone CGWA while the boundary of the proposed POU is less than a mile from the Cinder Cone CGWA. As noted by Brockway Engineering, water table impacts are being transferred closer to the CGWA. Figures 18 and 19 in the Brockway Engineering model report also suggest a larger and deeper cone of depression resulting from the proposed transfer when compared to the current cone of depression.

Large differences in groundwater level trends exist between the locations of the current and proposed POU (Figure 4). As Brockway Engineering states, "The groundwater elevations near the northwest portion of the Cinder Cone Butte Critical Groundwater Area have been experiencing a slight increase in elevation over the last few years, while the area near the southeastern portion of the critical groundwater area have seen steady declines" (Powell, 2009, p. 25). The extent to which stable or increasing trends in the vicinity of the proposed PODs could offset any pumping effects is unknown.

The source for differing trends is also currently unknown. Irrigation development near Simco Road in the southwestern portion of the CGWA is potentially a major contributor to water level trends in the area; however, northwest-trending faults mapped in the area (Bond, 1978) may serve as partial barriers to flow and contribute to the difference in trends between wells north/northeast of I-84 and those south/southwest of I-84. Faults that serve as flow barriers would be expected to cause greater drawdown than predicted by the consultant model near and within the CGWA as the result of pumping.

Question 4

- How does consultant information fit with other information previously provided to and analyzed by IDWR for the general area in question?

Data utilized to construct the Brockway Engineering model is generally consistent with information used or received by IDWR in recent hydrologic reports, with the exception of underflow. Information available from IDWR used in the model and previous reports includes: precipitation, irrigation, groundwater extraction, water levels, and well driller reports. Other methodologies implemented by Brockway Engineering that have been used by IDWR and others include the use of a published USGS WSRP model (Newton, 1991) and average annual ET values taken directly from ET Idaho (Allen, 2009).

Brockway Engineering's method to calculate underflow using Darcy's Law differs from the IDWR and SPF water balance methods used in the Nevid case, and the proportional method used in an IDWR staff memo of dividing USGS underflow equally across constant flux cells (IDWR, 2009b). Underflow rates calculated per method include:

- Brockway (IWC - Darcy): 2,250 af/yr/mi
- SPF (Nevid - Water balance): 800 af/yr/mi
- IDWR (I-84 memo - Proportional): 393 af/yr/mi
- IDWR (Nevid - Water balance): 270 af/yr/mi

A lack of data in the area has lead to a high degree of uncertainty in underflow estimation and values above vary by an order of magnitude. Because the modeling report author states that "the most sensitive input to the model was the aquifer underflow" (Powell, 2009, p. 31), high uncertainty in the underflow estimate makes model-derived predictions tenuous. Unfortunately, the modeling report does not provide documentation of the sensitivity of model predictions to variations in the rate of underflow.

Based on our review, data for quantifying underflow into the WSRP Aquifer with confidence are still lacking. A report documenting a model of groundwater flow in the Treasure Valley, for example, concludes "*The rate and spatial and vertical distribution of underflow into the valley and into the model domain is highly uncertain*" (Petrich, 2004, p. 107).

We agree with the consultant's determination that "significant data deficiencies remain and it is recommended that a data collection effort be immediately instigated by the State of Idaho to improve accuracy of the model inputs and provide a better basis for model calibration" (Powell, 2009, p. 30). A hydrogeologic characterization project is currently underway for East Ada County as part of the Treasure Valley CAMP. A future study of the Mountain Home Plateau was also proposed as part of the CAMP but the project is contingent on reinstatement of project funding by the legislature.

References

Allen, Richard G. and Clarence W. Robison, 2009. Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho: Supplement updating the Time Series through December 2008, Research Technical Completion Report, Kimberly Research and Extension Center, University of Idaho, Moscow, ID.

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Harrington, H., 2001. Mountain Home Plateau Ground Water Status and Management. Unpublished IDWR groundwater contour map.

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Newton, G., 1991. Geohydrology of the Regional Aquifer System, Western Snake River Plain, Southwestern Idaho. USGS Professional Paper 1408-G.

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Petrich, C.R., 2004. Simulation of Ground Water Flow in the Lower Boise River Basin. Idaho Water Resources Research Institute Research Report IWRRI-2004-02. 130 pp.

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Prickett, T.A. and C.G. Lonnquist, 1971. Selected Digital Computer Techniques for Groundwater Resource Evaluation, Illinois State Water Survey, Bulletin 55.

Shervais, J.W., Shroff, G., Vetter, S.K., Matthews, S., Hanan, B.B., and McGee, J.J., 2002. Origin of the western Snake River Plain: Implications from stratigraphy, faulting, and the geochemistry of basalts near Mountain Home, Idaho, *in* Bill Bonnichsen, C.M. White, & Michael McCurry, eds., Tectonic and Magmatic Evolution of the Snake River Plain Volcanic Province: Idaho Geological Survey Bulletin 30, Moscow, Idaho, p. 343-361.

SPF, 2009. Response to IDWR Memos Regarding Aquifer Recharge Along I-84 Corridor From Boise to Mountain Home. Consulting report prepared by SPF Water Engineering, LLC for Elk Creek Canyon, LLC.

Young, H. W., 1977. Reconnaissance of Ground Water Resources in the Mountain Home Plateau Area, Southwest Idaho. U. S. Geological Survey Water Resources Investigations 77-108. Open-File Report, 40 pp.

Attachment

February 18, 2010, IDWR Memo
from A. Wylie to C. Tesch

MEMO

State of Idaho
Department of Water Resources
322 E Front Street, P.O. Box 83720, Boise, Idaho 83720-0098
Phone: (208) 287-4800 Fax: (208) 287-6700

Date:	18 February 2010
To:	Craig Tesch
From:	Allan Wylie AW
cc:	Rick Raymondi, Sean Vincent
Subject:	Review of Shekinah Model

Craig

For the most part, the model was constructed reasonably given the available data; however, given the limited data, model predictive uncertainty (i.e. the ability to match the same filed observations with another model equally as well and get significantly different predictions) is likely quite high. Generally the better constrained the water budget, the lower the predictive uncertainty. The unfortunate truth here is that there are no constraints on underflow and as a result, no constraints on the total water budget. This means that one could change underflow and flux from the constant head boundaries and probably still calibrate the model, and these changes would probably affect the predicted impact of the transfer.

Please find my detailed comments below.

Pg 11 D.3. – Time domain definition: Steady state model; translation - not enough information, or budget, or both to do a transient model. With an acknowledged declining water table, I think it is hard to justify a steady state model. This assumption has the potential to impact the prediction.

Pg 12 D.5.1 – "Almost no data were available on the amount of underflow into the model domain (Newton, 1991)." Brockway Eng. calculated underflow using Darcy's law. Although probably the only option available, this results in a highly uncertain estimate.

Pg 12 D.5.2 – Specified head boundaries converted to specified flux. This is better than keeping the specified head boundaries, but it essentially means that the flux from these boundaries is a calibration parameter, probably with no constraints. The result is that predictive uncertainty will be high.

Pg 15 E.4. – Why estimate storativity for a steady state model?

Pg 15 E.5. – Why use the contours as calibration targets, why not use the observed heads?

Pg 17 G. Figure 11 arrow on right side of the figure should be "Inflow".

Pg 20 H. Model calibration: I am not buying that assuming steady state when you have an acknowledged declining water table and calibrating to a 1980 contour map is "most defensible". If the water table is continuing to decline, actual steady state heads will be lower, perhaps much lower, than the 1980 observations.

Pg 21 H.2. Model Calibration – Underflow: It appears that underflow along the northeast boundary is a calibration parameter, not a calibration target, further demonstrating that the water budget is not well constrained, and that predictive uncertainty is high.

Pg 23-30 I. Model Evaluation of Shekinah Industries Transfer: They predict head impacts from the transfer. This model will tend to under predict local impacts from pumping because 1) MODFLOW does not account for well efficiency, 2) although the GUI may allow the user to input the well diameter, the actual math in MODFLOW will show that in the model the well is the same size as the cell it is in, thus, in this case the well is 1320' X 1320' X 500'. 3) the model is steady state and during the irrigation season declines will be more than predicted and conversely, less during the non-irrigation season.

Allan Wylie

Attachment 2

Well Driller's Logs

63

843245

Office Use Only
Inspected by ______
Twp ____ Rge ____ Sec ____
____ 1/4 ____ 1/4 ____ 1/4
Lat: : : Long: : :

Form 238-7
3/95-C96

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

1. DRILLING PERMIT NO. __-__-__-__ ____

Other IDWR No. **D0047442**

2. OWNER:

Name **Bo Neilsen**

Address **10654 Wild Rd. Ct.**

City **Boise** State **ID** Zip **83713**

3. LOCATION OF WELL by legal description:

Sketch map location must agree with written location

N / W / E / S

Twp. **1** North ☒ or South ☐

Rge. **4** East ☒ or West ☐

Sec. **23** **NE** 1/4 (10 acres) **NE** 1/4 (40 acres) ____ 1/4 (160 acres)

Gov't lot ______ County ______

Lat: : : Long: : :

Address of Well Site **Slater Creek**

City **Mayfield**

(Give at least name of road + Distance to Road or Landmark)

Lt. ______ Blk. ______ Sub. Name ______

4. USE:

☒ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation

☐ Thermal ☐ Injection ☐ Other ______

5. TYPE OF WORK check all that apply (Replacement etc.)

☒ New Well ☐ Modify ☐ Abandonment ☐ Other ______

6. DRILL METHOD

☒ Air Rotary ☐ Cable ☐ Mud Rotary ☐ Other ______

7. SEALING PROCEDURES

SEAL/FILTER PACK			AMOUNT	METHOD
Material	From	To	Sacks or Pounds	
Granular Bentonite	**0**	**18**	**5 Sacks**	**Overbore**

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) **318'**

Was drive shoe seal tested? ☐ Y ☒ N How? ______

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
6	**+2**	**318**	**.250**	**Steel**	☒	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐

Length of Headpipe **5** Length of Tailpipe **5**

9. PERFORATIONS/SCREENS

☐ Perforations Method ______

☒ Screens Screen Type ______

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
315	**320**	**30**				☐	☐
						☐	☐
						☐	☐

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:

252 ft. below ground Artesian Pressure ____ lb

Depth flow encountered ____ ft. Describe access port or control devices: ______

11. WELL TESTS:

☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal/min.	Drawdown	Pumping Level	Time
30		**300**	**1 hr.**

Water Temp. ______ Bottom hole temp. ______

Water Quality test or comments ______

Depth first Water Encountered **315**

12. LITHOLOGIC LOG: (Describe repair or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temp.	Water Y	Water N
10"	**0**	**18'**	**Brown Clay**		☒
6	**18**	**145**	**Brown Clay**		☒
6	**145**	**165**	**Tan Sandy Clay**		☒
6	**165**	**238**	**Brown Clay**		☒
6	**238**	**244**	**Tan Sandy Clay w/Gravels**		☒
6	**244**	**315**	**Brown Sandy Clay**		☒
6	**315**	**320**	**Granite, sand and gravel**	☒	
6	**320**	**330**	**Brown Clay**		☒

RECEIVED
NOV 14 2006
WATER RESOURCES
WESTERN REGION

Completed Depth: **330 ft** (Measurable)

Date: Started **11/04/06** Completed **11/07/06**

13. DRILLER'S CERTIFICATION

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name **Hiddleston & Son, Inc.** Firm No. **35**

Firm Official Ross Date 11-11-06

Supervisor or Operator Ross Hiddleston Date 11-11-06

(Sign once if Firm Official & Operator)

Form 238-7
8/90

C

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

WELL DRILLER'S REPORT

USE TYPEWRITER OR BALLPOINT PEN

State law requires that this report be filed with the Director, Department of Water Resources within 30 days after the completion or abandonment of the well.

R-2

1. WELL OWNER

Name: Ron Ambrose
Address: 2295 E. 3100 South, Wendell, ID 83355
Drilling Permit No. 63-92-W-119
Water Right Permit No. ______

2. NATURE OF WORK

☒ New well ☐ Deepened ☐ Replacement
☐ Well diameter increase
☐ Abandoned (describe abandonment procedures such as materials, plug depths, etc. in lithologic log)

3. PROPOSED USE

☒ Domestic ☐ Irrigation ☐ Test ☐ Municipal
☐ Industrial ☐ Stock ☐ Waste Disposal or Injection
☐ Other ______ (specify type)

4. METHOD DRILLED

☒ Rotary ☒ Air ☐ Hydraulic ☐ Reverse rotary
☐ Cable ☐ Dug ☐ Other ______

5. WELL CONSTRUCTION

Casing schedule: ☒ Steel ☐ Concrete ☐ Other ______

Thickness	Diameter	From	To
.250 inches	8 5/8 inches	+ 2 feet	255 feet
inches	inches	feet	feet
inches	inches	feet	feet
inches	inches	feet	feet

Was casing drive shoe used? ☒ Yes ☐ No
Was a packer or seal used? ☐ Yes ☒ No
Perforated? ☐ Yes ☒ No
How perforated? ☐ Factory ☐ Knife ☐ Torch ☐ Gun
Size of perforation ______ inches by ______ inches

Number		From	To
	perforations	feet	feet
	perforations	feet	feet
	perforations	feet	feet

Well screen installed? ☐ Yes ☒ No
Manufacturer's name ______
Type ______ Model No. ______
Diameter ___ Slot size ___ Set from ___ feet to ___ feet
Diameter ___ Slot size ___ Set from ___ feet to ___ feet
Gravel packed? ☐ Yes ☒ No ☐ Size of gravel ______
Placed from ______ feet to ______ feet
Surface seal depth 98 Material used in seal: ☐ Cement grout ☒ Bentonite ☐ Puddling clay ☐
Sealing procedure used: ☐ Slurry pit ☐ Temp. surface casing ☒ Overbore to seal depth
Method of joining casing: ☐ Threaded ☒ Welded ☐ Solvent Weld ☐ Cemented between strata
Describe access port ______

6. LOCATION OF WELL

Sketch map location must agree with written location.

N
W E
X
S

Subdivision Name ______
Lot No. ______ Block No. ______
County Elmore
SW ¼ SE ¼ Sec. 23, T. 1 N ☒ S ☐ R. 4 E ☒ W ☐

RECEIVED
APR 09 1992

7. WATER LEVEL

Static water level 205 feet below land surface.
Flowing? ☐ Yes ☒ No G.P.M. flow ______
Artesian closed-in pressure ______ p.s.i.
Controlled by: ☐ Valve ☐ Cap ☐ Plug
Temperature ___ °F. Quality ______
Describe artesian or temperature zones below

8. WELL TEST DATA

☐ Pump ☐ Bailer ☒ Air ☐ Other ______

Discharge G.P.M.	Pumping Level	Hours Pumped
40		3

9. LITHOLOGIC LOG

Bore Diam.	Depth From	Depth To	Material	Water Yes	Water No
10	0	20	Decomposed granite		
"	20	24	Decomp granite and red clay		
"	24	60	Tan clay and sand		
10	60	98	Gravel and sand		
8	98	110	Tan clay		
"	110	160	Tan clay sand		
"	160	180	Sand and ½ gravel		
"	180	225	Sand		
"	225	250	Tan clay and sand		
"	250	253	Sand	X	
8	253	256	Sand and gravel		

RECEIVED
MAR 31 1992
Department of Water Resources

RECEIVED
MAR 24 1992
Department of Water Resources
Regional Office

10.

Work started 3/10/92 finished 3/13/92

11. DRILLERS CERTIFICATION

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name Hiddleston & Son, Inc Firm No. 35
Address Rt. 3, Box 610-D Mtn Home, ID 83647 Date 3/16/92
Signed by (Firm Official) Mark Hiddleston
and
(Operator) John H Smith

USE ADDITIONAL SHEETS IF NECESSARY — FORWARD THE WHITE COPY TO THE DEPARTMENT

RECEIVED
OCT 07 1988
Department of Water Resources

RECEIVED
SEP 28 1988
Department of Water Resources

USE TYPEWRITER OR BALLPOINT PEN

PH

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

State law requires that this report be filed with the Director, Department of Water Resources within 30 days after the completion or abandonment of the well.

1. WELL OWNER

Name Leo Zimmer

Address Mayfield Stage

Owner's Permit No. 63-88-2-175

2. NATURE OF WORK

☐ New well ☐ Deepened ☒ Replacement

☐ Abandoned (describe abandonment procedures such as materials, plug depths, etc. in lithologic log)

3. PROPOSED USE

☒ Domestic ☐ Irrigation ☐ Test ☐ Municipal

☐ Industrial ☐ Stock ☐ Waste Disposal or Injection

☐ Other ______ (specify type)

4. METHOD DRILLED

☒ Rotary ☐ Air ☐ Hydraulic ☐ Reverse rotary

☐ Cable ☐ Dug ☐ Other

5. WELL CONSTRUCTION

Casing schedule: ☒ Steel ☐ Concrete ☐ Other

Thickness		Diameter		From		To	
.250	inches	6	inches	+ 1	feet	117	feet
	inches		inches		feet		feet
	inches		inches		feet		feet
	inches		inches		feet		feet

Was casing drive shoe used? ☒ Yes ☐ No

Was a packer or seal used? ☐ Yes ☒ No

Perforated? ☐ Yes ☐ No

How perforated? ☐ Factory ☐ Knife ☐ Torch

Size of perforation ______ inches by ______ inches

Number		From		To	
	perforations		feet		feet
	perforations		feet		feet
	perforations		feet		feet

Well screen installed? ☐ Yes ☐ No

Manufacturer's name

Type ______ Model No.

Diameter ___ Slot size ___ Set from ___ feet to ___ feet

Diameter ___ Slot size ___ Set from ___ feet to ___ feet

Gravel packed? ☐ Yes ☒ No ☐ Size of gravel

Placed from ______ feet to ______ feet

Surface seal depth 18 Material used in seal: ☐ Cement grout ☒ Bentonite ☐ Puddling clay ☐

Sealing procedure used: ☐ Slurry pit ☐ Temp. surface casing ☒ Overbore to seal depth

Method of joining casing: ☐ Threaded ☐ Welded ☐ Solvent Weld

☐ Cemented between strata

Describe access port Santa Seal

6. LOCATION OF WELL

Sketch map location must agree with written location.

N / W / E / S

Subdivision Name

Lot No. ______ Block No. ______

County Elmore

W ¼ SW ¼ Sec. 13, T. 1 N/S, R. 4 E/W.

7. WATER LEVEL

Static water level 92 feet below land surface.

Flowing? ☐ Yes ☒ No G.P.M. flow

Artesian closed-in pressure ______ p.s.i.

Controlled by: ☐ Valve ☐ Cap ☐ Plug

Temperature 59 °F. Quality Good

Describe artesian or temperature zones below.

8. WELL TEST DATA

☐ Pump ☐ Bailer ☒ Air ☐ Other

Discharge G.P.M.	Pumping Level	Hours Pumped
20	125	2

9. LITHOLOGIC LOG

Bore Diam.	Depth From	Depth To	Material	Water Yes	Water No
10	0	½	Top Soil		
10	½	18	Silty Clay, Brown		
6	18	19	" " "		
"	19	20	gravel Black, Sand white		
	20	49	Silty clay, yellow		
	49	50	clay, Rich Brown		
	50	54	Silty clay, yellow		
	54	57	Sand, white, corse		
	57	68	Sandy clay, Fine to corse yellow Brown		
	68	72	gravel, Small, Sands Fine to corse white		
	72	89	Sandy clay, Fine to corse yellow Brown		
	89	90	Sandy clay, Rust Brown		
	90	114	Sandy clay, yellow		
	114	116	gravel, white, small, Sand, white corse	X	
	116	150	Sand Stone, white, Broken		
	150	155	Sand, corse, white, with clay Inter Beds		
	155	196	Consaladated Conglmert Broken (gravel - white + black, Sand corse white, Clay stone)		
	196	200	gravel Black + white Loose	X	

Department of Water Resources
Western Regional Office

10.

Work started Sept 2-88 finished Sept 4-88

11. DRILLERS CERTIFICATION

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name Frank Shelley Firm No. 326

Address 900 NW 4th AVE Date 9-12-88

Signed by (Firm Official) Frank Shelley

and

(Operator) Marvin Haines

USE ADDITIONAL SHEETS IF NECESSARY — FORWARD THE WHITE COPY TO THE DEPARTMENT

81553

Form 238-7
3/95-C96

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

Office Use Only
Inspected by ____
Twp ____ Rge ____ Sec ____
____ 1/4 ____ 1/4 ____ 1/4
Lat : : Long: : :

1. DRILLING PERMIT NO. __ - __ - __ - __
Other IDWR No. D0031310

2. OWNER:
Name Larry Farnsworth
Address 1020 N. Breezy Lane
City Mayfield State ID Zip 83716

3. LOCATION OF WELL by legal description:
Sketch map location must agree with written location

N / W / E / S

Twp. 1 North ☒ or South ☐
Rge. 4 East ☒ or West ☐
Sec. 23 __ 1/4 (10 acres) NE 1/4 (40 acres) NE 1/4 (160 acres)
Gov't lot ____ County Elmore
Lat: : : Long: : :
Address of Well Site 1 Mile North on Slater Creek
City Mayfield
(Give at least name of road + Distance to Road or Landmark)
Lt. ____ Blk. ____ Sub. Name ____

4. USE:
☒ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other ____

5. TYPE OF WORK check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other ____

6. DRILL METHOD
☒ Air Rotary ☐ Cable ☐ Mud Rotary ☐ Other ____

7. SEALING PROCEDURES

SEAL/FILTER PACK			AMOUNT	METHOD
Material	From	To	Sacks or Pounds	
Bentonite	0	18	600 Lbs	overbore

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) ____
Was drive shoe seal tested? ☐ Y ☒ N How? ____

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
6.625	+2	147	250	Steel	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐

Length of Headpipe ____ Length of Tailpipe ____

9. PERFORATIONS/SCREENS
☐ Perforations Method ____
☐ Screens Screen Type ____

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
						☐	☐
						☐	☐
						☐	☐

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
69 ft. below ground Artesian Pressure ____ lb
Depth flow encountered ____ ft. Describe access port or control devices: ____

11. WELL TESTS:
☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal/min.	Drawdown	Pumping Level	Time
60			1 Hr

Water Temp. ____ Bottom hole temp. ____
Water Quality test or comments: ____
Depth first Water Encountered 138'

12. LITHOLOGIC LOG: (Describe repair or abandonment)

Bore Dia	From	To	Remarks: Lithology, Water Quality & Temp.	Water Y	Water N
10	0	1	Topsoil		☒
10	1	8	Sandy clay, tan		☒
10	8	10	Tan clay		☒
10	10	12	Tan sand & clay		☒
10	12	18	Sandy clay, tan		☒
6	18	30	Sandy clay, tan		☒
6	30	38	Clay, cream		☒
6	38	58	Sandy clay, cream		☒
6	58	65	Tan sand		☒
6	65	88	Clay		☒
6	88	98	Sandy clay, tan		☒
6	98	118	Sandy clay		☒
6	118	135	Sandy clay		☒
6	135	138	Clay, wet	☒	
6	138	147	Sand, white	☒	

RECEIVED
JUN 28 2004
WATER RESOURCES
WESTERN REGION

Completed Depth: 147 (Measurable)
Date: Started 05/20/04 Completed 05/21/04

13. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name Hiddleston & Son Inc-Boise Firm No. 35
Firm Official [signature] Date 6-18-04
Supervisor or Operator [signature] Date 6-18-04
(Sign once if Firm Official & Operator)

Date: 6/11/2004 Time: 12:36 PM

843964

Pg #1

Form 238-7 6/02 63

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

Office Use Only
Well ID No. 414141
Inspected by ______
Twp ____ Rge ____ Sec ____
____ 1/4 ____ 1/4 ____ 1/4
Lat: : : Long: : :

1. WELL TAG NO. D 0047651
DRILLING PERMIT NO. 897529-843964
Water Right or Injection Well No. 63-12447

2. OWNER:
Name ARK PROPERTIES LLC
Address 11204 N BAR 21 DR
City GLENNS FERRY State ID Zip 83623

3. LOCATION OF WELL by legal description:
You must provide address or Lot, Blk, Sub. or Directions to well.
Twp. 1 North ☒ or South ☐
Rge. 4 East ☒ or West ☐
Sec. 24 , ____ 1/4 (10 acres) SW 1/4 (40 acres) SW 1/4 (160 acres)
Gov't Lot ____ County ELMORE
Lat: 43 : 24 : 6 Long: 115 : 56 : 6
Address of Well Site 1/2 mi EAST, 1/4 mi SOUTH OF INDIAN CREEK Rd SLATOR CREEK Rd INTERSECTION City MAYFIELD
(Give at least name of road + Distance to Road or Landmark)
Lt. ____ Blk. ____ Sub. Name N/A

4. USE:
☐ Domestic ☐ Municipal ☐ Monitor ☒ Irrigation
☐ Thermal ☐ Injection ☐ Other ____

5. TYPE OF WORK check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other ____

6. DRILL METHOD:
☐ Air Rotary ☐ Cable ☐ Mud Rotary ☒ Other REVERSE

7. SEALING PROCEDURES

Seal Material	From	To	Weight / Volume	Seal Placement Method
1" BENTONITE	0	394	37,000	DRY POUR
1" BENTONITE	630	650	5,000	DRY POUR

Was drive shoe used? ☐ Y ☒ N Shoe Depth(s) ____
Was drive shoe seal tested? ☐ Y ☒ N How? ____

8. CASING/LINER: 16" X 10" REDUCER @ 431'

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
16	+2	431	.375	STEEL	☒	☐	☒	☐
10	462	468	.365	STEEL	☒	☐	☒	☐
10	478	542	.365	STEEL	☒	☐	☒	☐

Length of Headpipe ____ Length of Tailpipe 5'
Packer ☐ Y ☒ N Type ____

9. PERFORATIONS/SCREENS PACKER TYPE
Perforation Method ____
Screen Type & Method of Installation JOHNSON WIRE WRAP

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
432	462	.030		10	S.S.	☒	☐
468	478	.030		10	S.S.	☒	☐
542	552	.030		10	S.S.	☒	☐

10. FILTER PACK

Filter Material	From	To	Weight / Volume	Placement Method
#6-9 SAND	394	574	27,000	DRY POUR
#8-12 SAND	574	640	12,000	" "

11. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
229 ft. below ground Artesian pressure ____ lb.
Depth flow encountered ____ ft. Describe access port or control devices: 1 1/2" PIPE ON SIDE

12. WELL TESTS:
☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
1700 gpm	142	371	8 hrs

Water Temp. ____ Bottom hole temp. ____
Water Quality test or comments: ____
Depth first Water Encounter ____

13. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
24	0	3	TOP SOIL		
	3	5	CLECHE		
	5	45	COARSE SAND		
	45	168	DECOMPOSED GRANITE w/sm CLAY LAYERS		
	168	212	FINE - COARSE SAND		
	212	221	BRN CLAY		
	221	223	COARSE SAND		
	223	245	BRN CLAY		
	245	265	FINE-MED SAND		
	265	273	GRANITE		
	273	335	BRN CLAY w/SAND LAYERS		
	335	343	DECOMPOSED GRANITE		
	343	404	CLAY w/sm DECOMPOSE GRANITE LAYER		
	404	410	FINE SAND		
	410	419	BRN CLAY		
	419	440	WHITE CLAY w/COARSE SAND LAYER		
19	440	483	COARSE SAND w/sm CLAY LAYERS		
	483	513	SAND w/SOME CLAY		
	513	541	BRN CLAY, SOME BLUE CLAY		
	541	622	FINE-COARSE SAND w/sm YELLOW CLAY LAY		
	622	636	CLAY w/SOME FINE SAND		
	636	641	FINE BLUE SAND		
	641	657	CLAY w/sm SAND LAYER		
	657	674	FINE WHITE SAND SOME CLAY		
	674	690	CLAY w/ SAND STONE LAYER		

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WATER RESOURCES WESTERN REGION

Completed Depth 622 (Measurable)
Date: Started 12-6-06 Completed 1-23-07

14. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name RIVERSIDE INC Firm No. 333
Principal Driller [signature] Date 2-8-07
and
Driller or Operator II [signature] Date 2-8-07
Operator I [signature] Date 2-8-07

Principal Driller and Rig Operator *Required.*
Operator I must have signature of Driller/Operator II.

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Pg#2

Form 238-7
6/02

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

Office Use Only
Well ID No.
Inspected by
Twp ____ Rge ____ Sec ____
____ 1/4 ____ 1/4 ____ 1/4
Lat: : : Long: : :

1. WELL TAG NO. D 0047651
DRILLING PERMIT NO. 897529-843964
Water Right or Injection Well No. 63-12447

2. OWNER:
Name ARK PROPERTIES LLC
Address 11204 N BAR 21 DR
City GLENNS FERRY State ID Zip 83623

3. LOCATION OF WELL by legal description:
You must provide address or Lot, Blk, Sub. or Directions to well.
Twp. ____ North ☐ or South ☐
Rge. ____ East ☐ or West ☐
Sec. ____, ____ 1/4 (10 acres) ____ 1/4 (40 acres) ____ 1/4 (160 acres)
Gov't Lot ____ County ____
Lat: : : **Long:** : :
Address of Well Site ____
____ City ____
(Give at least name of road + Distance to Road or Landmark)
Lt. ____ Blk. ____ Sub. Name ____

4. USE:
☐ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other ____

5. TYPE OF WORK check all that apply (Replacement etc.)
☐ New Well ☐ Modify ☐ Abandonment ☐ Other ____

6. DRILL METHOD:
☐ Air Rotary ☐ Cable ☐ Mud Rotary ☐ Other ____

7. SEALING PROCEDURES

Seal Material	From	To	Weight / Volume	Seal Placement Method

Was drive shoe used? ☐ Y ☐ N Shoe Depth(s) ____
Was drive shoe seal tested? ☐ Y ☐ N How? ____

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
10	552	562	.365	STEEL	X	☐	X	☐
10	572	577	.365	STEEL	X	☐	X	☐
10	602	612	.365	STEEL	X		X	☐

Length of Headpipe ____ Length of Tailpipe 5'
Packer ☐ Y ☐ N Type ____

9. PERFORATIONS/SCREENS PACKER TYPE
Perforation Method ____
Screen Type & Method of Installation JOHNSON WIRE WRAP

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
562	572	.030		10	S.S.	X	☐
577	602	.030		10	S.S.	X	☐
612	622	.030		10	S.S.	X	☐

10. FILTER PACK

Filter Material	From	To	Weight / Volume	Placement Method

11. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
____ ft. below ground Artesian pressure ____ lb.
Depth flow encountered ____ ft. Describe access port or control devices: ____

12. WELL TESTS:
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time

Water Temp. ____ Bottom hole temp. ____
Water Quality test or comments: ____
____ Depth first Water Encounter ____

13. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	**Remarks:** Lithology, Water Quality & Temperature	Water Y	Water N

Completed Depth ____ (Measurable)
Date: Started ____ Completed ____

14. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name ____ Firm No. ____
Principal Driller ____ Date ____
and
Driller or Operator II ____ Date ____
Operator I ____ Date ____

Principal Driller and Rig Operator *Required.*
Operator I must have signature of Driller/Operator II.

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PAGE 1 of 2

Form 238-7
6/02

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

Office Use Only	
Well ID No.	420886
Inspected by	
Twp ___ Rge ___ Sec ___	
___ 1/4 ___ 1/4 ___ 1/4	
Lat: : :	Long: : :

1. WELL TAG NO. D 0052697
DRILLING PERMIT NO. 904076-851081
Water Right or Injection Well No. 63-12447

2. OWNER:
Name ARK PROPERTIES LLC
Address 11204 N BAR 21 DR
City GLENNS FERRY State ID Zip 83623

3. LOCATION OF WELL by legal description:
You must provide address or Lot, Blk, Sub. or Directions to well.
Twp. 2 North ☒ or South ☐
Rge. 4 East ☒ or West ☐
Sec. 24, NW 1/4 (10 acres) SW 1/4 (40 acres) NE 1/4 (160 acres)
Gov't Lot ___ County ELMORE
Lat: 43 : 24 : 654 Long: 115 : 55 : 486
Address of Well Site 1 MILE NE OF INDIAN CREEK Rd SLATOR CREEK Rd INTERSECTION City MAYFIELD
(Give at least name of road + Distance to Road or Landmark)
Lt. ___ Blk. ___ Sub. Name ___

4. USE:
☐ Domestic ☐ Municipal ☐ Monitor ☒ Irrigation
☐ Thermal ☐ Injection ☐ Other ___

5. TYPE OF WORK check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other ___

6. DRILL METHOD:
☐ Air Rotary ☐ Cable ☐ Mud Rotary ☒ Other REVERSE

7. SEALING PROCEDURES

Seal Material	From	To	Weight / Volume	Seal Placement Method
BENTONITE	0	560	57,500	DRY POUR

Was drive shoe used? ☐ Y ☒ N Shoe Depth(s) ___
Was drive shoe seal tested? ☐ Y ☐ N How? ___

8. CASING/LINER: 16" x 10" REDUCER @ 602

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
16	+2	602	.375	STEEL	☒	☐	☒	☐
10	612	638	.365	STEEL	☒	☐	☒	☐
10	678	690	.365	STEEL	☒	☐	☒	☐

Length of Headpipe N/A Length of Tailpipe 3'
Packer ☐ Y ☒ N Type ___

9. PERFORATIONS/SCREENS PACKER TYPE
Perforation Method ___
Screen Type & Method of Installation JOHNSON WIRE WRAP

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
602	612	.030		10"	S.S.	☒	☐
638	678	.030		10	S.S	☒	☐
690	750	.040		10	S.S	☒	☐

10. FILTER PACK

Filter Material	From	To	Weight / Volume	Placement Method
#8-12 SAND	560	685	12,000	DRY POUR
#6-9 SAND	685	809	15,000	DRY POUR

11. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
270 ft. below ground Artesian pressure ___ lb.
Depth flow encountered ___ ft. Describe access port or control devices:
1 1/2" PIPE ON SIDE

12. WELL TESTS:
☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
2000	129	399	6 hrs

Water Temp. 75 Bottom hole temp. 75
Water Quality test or comments: ___
Depth first Water Encounter ___

13. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
24	0	4	TOP SOIL		X
	4	12	CLEAYY		X
	12	33	FINE-COARSE SAND		X
	33	34	BRN CLAY		X
	34	98	FINE-COARSE SAND w/SM BRN CLAY LAYERS		X
	98	115	BRN CLAY		X
	115	126	FINE-MED SAND		X
	126	156	BRN CLAY w/SM SAND STREAK		X
	156	209	FINE-MED SAND w/SM BRN CLAY LAYERS		X
	209	217	SANDY LT TAN CLAY		X
	217	222	COARSE SAND w/PEA GRAVEL		X
	222	237	FINE SAND		X
	237	267	BLUE, BROWN CLAY		X
	267	274	SANDY TAN CLAY		X
	274	294	FINE-COARSE SAND, GRAVEL	X	
	294	305	BRN CLAY		X
	305	327	FINE BRN SAND	X	
	327	352	BRN, TAN CLAY		X
	352	363	COARSE SAND w/PEA GRAVEL	X	
	363	365	BRN CLAY		X
	365	445	FINE-COARSE SAND w/SM CLAY LAYERS	X	
	445	481	BRN CLAY w/SAND MIX		X
	481	484	FINE-COARSE SAND	X	
	484	533	FINE-MED SAND SOME CLAY	X	
	533	538	BRN CLAY		X
	538	545	FINE-MED SAND w/CLAY MIX	X	
	545	550	BRN CLAY		X
	550	586	GREY CLAY w/FINE-MED SAND LAYER		X
	586	618	FINE-MED SAND w/CLAY MIX	X	
18"	618	624	BRN CLAY		X
	624	626	SANDY BLUE CLAY		X
	626	756	FINE-MED SAND w/SM CLAY LAYERS	X	
	756	769	SANDY BRN CLAY		X

Completed Depth 795' (Measurable)
Date: Started 4-24-08 Completed 6-12-08

14. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name RIVERSIDE INC Firm No. 333
Principal Driller ___ Date 6-16-08
and
Driller or Operator II ___ Date 6-16-08
Operator I ___ Date ___
Principal Driller and Rig Operator *Required.*
Operator I must have signature of Driller/Operator II.

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WATER RESOURCES
WESTERN REGION

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Form 238-7
6/02

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

Office Use Only
Well ID No. 420886
Inspected by
Twp ___ Rge ___ Sec ___
___ 1/4 ___ 1/4 ___ 1/4
Lat: : : Long: : :

1. WELL TAG NO. D 0052697
DRILLING PERMIT NO. 904076-851081
Water Right or Injection Well No. 63-12447

2. OWNER:
Name ARK PROPERTIES LLC
Address 11204 N BAR 21 DR
City GLENNS FERRY State ID Zip 83623

3. LOCATION OF WELL by legal description:
You must provide address or Lot, Blk, Sub. or Directions to well.
Twp. 1 North ☒ or South ☐
Rge. 4 East ☒ or West ☐
Sec. 24, ___ 1/4 (10 acres) SW 1/4 (40 acres) NE 1/4 (160 acres)
Gov't Lot ___ County ELMORE
Lat: : : Long: : :
Address of Well Site 1 MILE NE of INDIAN CREEK Rd. SLATOR CREEK Rd INTERSECTION City MAYFIELD
(Give at least name of road + Distance to Road or Landmark)
Lt. ___ Blk. ___ Sub. Name ___

4. USE:
☐ Domestic ☐ Municipal ☐ Monitor ☒ Irrigation
☐ Thermal ☐ Injection ☐ Other ___

5. TYPE OF WORK check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other ___

6. DRILL METHOD:
☐ Air Rotary ☐ Cable ☐ Mud Rotary ☐ Other ___

7. SEALING PROCEDURES

Seal Material	From	To	Weight / Volume	Seal Placement Method

Was drive shoe used? ☐ Y ☐ N Shoe Depth(s) ___
Was drive shoe seal tested? ☐ Y ☐ N How? ___

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
10	750	762	.365	STEEL	☒	☐	☒	☐
10	772	782	.365	STEEL	☒	☐	☒	☐
10	792	795	.365	STEEL	☒	☐	☒	☐

Length of Headpipe ___ Length of Tailpipe ___
Packer ☐ Y ☐ N Type ___

9. PERFORATIONS/SCREENS PACKER TYPE
Perforation Method ___
Screen Type & Method of Installation ___

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
762	772	.040		10	S.S.	☒	☐
782	792	.040		10	S.S.	☒	☐
						☐	☐

10. FILTER PACK

Filter Material	From	To	Weight / Volume	Placement Method

11. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
___ ft. below ground Artesian pressure ___ lb.
Depth flow encountered ___ ft. Describe access port or control devices: ___

12. WELL TESTS:
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal./min	Drawdown	Pumping Level	Time

Water Temp. ___ Bottom hole temp. ___
Water Quality test or comments: ___
___ Depth first Water Encounter ___

13. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
18	769	775	COARSE-MED SAND W/PEA GRAVEL	X	
	775	787	GREY CLAY		X
	787	797	MED-COARSE SAND W/PEA GRAVEL	X	
	797	809	BLUE CLAY		X

Completed Depth ___ (Measurable)
Date: Started ___ Completed ___

14. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name ___ Firm No. ___
Principal Driller ___ Date ___
and
Driller or Operator II ___ Date ___
Operator I ___ Date ___

Principal Driller and Rig Operator *Required.*
Operator I must have signature of Driller/Operator II.

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13

851510

Office Use Only
Well ID No. 421306
Inspected by
Twp ___ Rge ___ Sec ___
___ 1/4 ___ 1/4 ___ 1/4
Lat: : : Long: : :

Form 238-7
6/02

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

1. WELL TAG NO. D 0048369
DRILLING PERMIT NO.
Water Right or Injection Well No.

2. OWNER:
Name MAYFIELD TOWNSITE LLC
Address 4487 N. DRESDEN PLACE, SUITE 102
City BOISE State ID Zip 83714

3. LOCATION OF WELL by legal description:
You must provide address or Lot, Blk, Sub. or Directions to well.
Twp. 1 North ☒ or South ☐
Rge. 5 East ☒ or West ☐
Sec. 18, ___ 1/4 (10 acres) SW 1/4 (40 acres) SW 1/4 (160 acres)
Gov't Lot ___ County ELMORE
Lat: : : Long: : :
Address of Well Site 425 ft S.E. of INDIAN CREEK Rd + 1.75 MILES NE of INDIAN CREEK/SLATER CREEK Rd City
(Give at least name of road + Distance to Road or Landmark)
Lt. ___ Blk. ___ Sub. Name ___

4. USE:
☒ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other

5. TYPE OF WORK check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other

6. DRILL METHOD:
☒ Air Rotary ☐ Cable ☐ Mud Rotary ☐ Other

7. SEALING PROCEDURES

Seal Material	From	To	Weight / Volume	Seal Placement Method
BENTONITE	0	20	750	DRY POUR

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 190
Was drive shoe seal tested? ☐ Y ☐ N How?

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
8	+2	190	.250	STEEL	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐

Length of Headpipe 10' Length of Tailpipe
Packer ☐ Y ☒ N Type

9. PERFORATIONS/SCREENS PACKER TYPE
Perforation Method
Screen Type & Method of Installation JOHNSON WIRE WRAP

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
190	195	.015		6	S.S.	☒	☐
195	200	.025		6	S.S.	☒	☐
						☐	☐

10. FILTER PACK

Filter Material	From	To	Weight / Volume	Placement Method

11. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
145 ft. below ground Artesian pressure ___ lb.
Depth flow encountered ___ ft. Describe access port or control devices:
SANITARY WELL CAP

12. WELL TESTS:
☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
20-30		195	1 hr

Water Temp. 65 Bottom hole temp.
Water Quality test or comments:
Depth first Water Encounter

13. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
12	0	2	TOP SOIL		X
	2	9	HARD CLECHY		X
	9	15	FINE-COARSE SAND		X
	15	18	BRN CLAY		X
8	18	57	BRN CLAY		X
	57	91	FINE-MED SAND		X
	91	110	BRN CLAY		X
	110	125	BRN CLAY W/SAND STREAKS		X
	125	157	BRN CLAY		X
	157	200	FINE-COARSE SAND	X	

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WATER RESOURCES
WESTERN REGION

Completed Depth 200' (Measurable)
Date: Started 5-12-08 Completed 6-10-08

14. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name RIVERSIDE INC Firm No. 333

Principal Driller [signature] Date 6-30-08
and
Driller or Operator II [signature] Date 6-30-08

Operator I ___ Date ___

Principal Driller and Rig Operator *Required*.
Operator I must have signature of Driller/Operator II.

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63

Form 238-7
6/07

862443

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

1. WELL TAG NO. D D0060212

Drilling Permit No. 913816 - 862443

Water right or injection well # —

2. OWNER

Name IDWR

Address 322 East Front Street

City Boise State ID Zip 83720

3. WELL LOCATION:

Twp. 1 North ☒ or South ☐ Rge. 4 East ☒ or West ☐

Sec. 23 SW 1/4 (10 acres) SE 1/4 (40 acres) NE 1/4 (160 acres)

Gov't Lot ______ County Elmore

Lat. 43 ° 24.494 (Deg. and Decimal minutes)

Long. 115 ° 56.335 (Deg. and Decimal minutes)

Address of Well Site Farm field approx. 1/4mi NE of Indian Cr. Rd. & Slater Cr. Rd.

(Give at least name of road + Distance to Road or Landmark) City Mayfield

Lot. ______ Blk. ______ Sub. Name ______

4. USE:

☐ Domestic ☐ Municipal ☒ Monitor ☐ Irrigation ☐ Thermal ☐ Injection ☐ Other

5. TYPE OF WORK check all that apply (Replacement etc.)

☒ New Well ☐ Replacement well ☐ Modify existing well ☐ Abandonment ☐ Other

6. DRILL METHOD:

☐ Air Rotary ☒ Mud Rotary ☐ Cable ☐ Other

7. SEALING PROCEDURES

Seal material	From (ft)	To (ft)	Quantity (lbs or ft³)	Placement method/procedure
3/8bentchps	0'	50'	1850 lbs	poured & tagged
DFGrt/Cmnt	30'	415'	120 cu.ft.	tremie

8. CASING/LINER:

Diameter (nominal)	From (ft)	To (ft)	Gauge/ Schedule	Material	Casing	Liner	Threaded	Welded
8"	+1.5'	52	.250	steel	☒	☐	☐	☒
4"	+1'	420	sc80	PVC	☒	☐	☒	☐
4"	440'	450'	sc80	PVC	☒	☐	☒	☐

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 52

9. PERFORATIONS/SCREENS:

Perforations ☐ Y ☐ N Method ______

Manufactured screen ☒ Y ☐ N Type PVC factory slotted

Method of installation set in

From (ft)	To (ft)	Slot size	Number/ft	Diameter (nominal)	Material	Gauge or Schedule
420'	440'	.020		4"	PVC	Sch80

Length of Headpipe ______ Length of Tailpipe 10'

Packer ☐ Y ☒ N Type ______

10. FILTER PACK:

Filter Material	From (ft)	To (ft)	Quantity (lbs or ft³)	Placement method
8-12 sand	415'	454'	1250 lbs.	poured & tagged
medbentchip	454'	500'	850 lbs.	poured-backfill

11. FLOWING ARTESIAN:

Flowing Artesian? ☐ Y ☒ N Artesian Pressure (PSIG) ______

Describe control device ______

12. STATIC WATER LEVEL and WELL TESTS:

Depth first water encountered (ft) 15 Static water level (ft) 183

Water temp. (°F) ______ Bottom hole temp. (°F) ______

Describe access port ______

Well test: Test method:

Drawdown (feet)	Discharge or yield (gpm)	Test duration (minutes)
5	17	480

Pump ☒ Bailer ☐ Air ☐ Flowing artesian ☐

Water Quality test or comments: ______

13. LITHOLOGIC LOG and/or repairs or abandonment:

Bore Dia. (in)	From (ft)	To (ft)	Remarks, lithology or description of repairs or abandonment, water temp.	Water Y	Water N
12"	0'	2'	brown top soil		X
12"	2'	12'	brown sandy clay		x
12"	12'	43'	light grey sand	X	
12"	43'	50'	light brown sand		X
8"	50'	52'	tan clay		X
8"	52'	58'	grey sand		X
8"	58'	64'	tan sand & clay strips		X
8"	64'	85'	brown sand	X	
8"	85'	138'	light brown sand & clay strips		X
8"	138'	222'	brown sand & clay strips		X
8"	222'	235'	white/grey sand		X
8"	235'	246'	brown sand & clay strips		X
8"	246'	285'	light brown clay		X
8"	285'	310'	grey sand		X
8"	310'	340'	brown sand & clay strips		X
8"	340'	352'	brown clay		X
8"	352'	357'	grey clay		X
8"	357'	375'	grey sand & clay strips		X
8"	375'	420'	grey & brown sand & clay strips		X
8"	420'	440'	grey sand		X
8"	440'	460'	tan sandy clay		X
8"	460'	470'	grey clay		X
8"	470'	475'	tan & grey sandy clay		X
8"	475'	477'	grey clay		X
8"	477'	483'	grey sandy clay		X
8"	483'	500'	grey clay		X
			Med. chips 0'-30' 500 lbs. btwn 8" & 4"		

Completed Depth (Measurable) 450

Date: Started 11-10-2011 Completed 11-15-2011

14. DRILLER'S CERTIFICATION

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name Down Right Drilling & Pump,Inc Co. No. 637

*Principal Driller [signature] Date 12-14-11

*Driller [signature] Date 12-14-11

*Operator II ______ Date ______

Operator I ______ Date ______

* Signature of Principal Driller and rig operator are required.

SCANNED DEC 19 2011

RECEIVED DEC 19 2011 WATER RESOURCES WESTERN REGION

W5 862552

Form 238-7
6/07

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

1. WELL TAG NO. D 0060214

Drilling Permit No. 913924-862552

Water right or injection well # —

2. OWNER

Name IDWR

Address 322 East Front Street

City Boise State ID Zip 83720

3. WELL LOCATION:

Twp. 1 North ☒ or South ☐ Rge. 4 East ☒ or West ☐

Sec. 23 SW 1/4 (10 acres) SE 1/4 (40 acres) NE 1/4 (160 acres)

Gov't Lot ____ County Elmore

Lat. 43 ° 24.496 (Deg. and Decimal minutes)

Long. 115 ° 56.332 (Deg. and Decimal minutes)

Address of Well Site Farm field approx 1/4mi NE if Indian Cr. Rd. & Slater Cr Rd City Mayfield

(Give at least name of road + Distance to Road or Landmark)

Lot. ____ Blk. ____ Sub. Name ____

4. USE:

☐ Domestic ☐ Municipal ☒ Monitor ☐ Irrigation ☐ Thermal ☐ Injection
☐ Other

5. TYPE OF WORK check all that apply (Replacement etc.)

☒ New Well ☐ Replacement well ☐ Modify existing well
☐ Abandonment ☐ Other

6. DRILL METHOD:

☐ Air Rotary ☒ Mud Rotary ☐ Cable ☐ Other

7. SEALING PROCEDURES

Seal material	From (ft)	To (ft)	Quantity (lbs or ft³)	Placement method/procedure
3/8 bentchips	0'	18'	450 lbs.	poured
3/8 bentchips	80'	100'	250 lbs.	poured

8. CASING/LINER:

Diameter (nominal)	From (ft)	To (ft)	Gauge/ Schedule	Material	Casing	Liner	Threaded	Welded
6"	+2'	18'	.250	steel	☒	☐	☐	☒
2"	+2'	55'	sc40	PVC	☒	☐	☒	☐
2"	65'	75	sc40	PVC	☒	☐	☒	☐

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 18

9. PERFORATIONS/SCREENS:

Perforations ☐ Y ☐ N Method Factory

Manufactured screen ☒ Y ☐ N Type ~~" "~~ PVC

Method of installation casing string

From (ft)	To (ft)	Slot size	Number/ft	Diameter (nominal)	Material	Gauge or Schedule
55'	65'	.020		2"	PVC	sch 40

Length of Headpipe ____ Length of Tailpipe 10'

Packer ☐ Y ☒ N Type ____

10. FILTER PACK:

Filter Material	From (ft)	To (ft)	Quantity (lbs or ft³)	Placement method
8-12 sand	54'	80'	550 lbs.	poured

11. FLOWING ARTESIAN:

Flowing Artesian? ☐ Y ☒ N Artesian Pressure (PSIG) ____

Describe control device ____

12. STATIC WATER LEVEL and WELL TESTS:

Depth first water encountered (ft) 15 Static water level (ft) 62

Water temp. (°F) ____ Bottom hole temp. (°F) ____

Describe access port ____

Well test:

Drawdown (feet)	Discharge or yield (gpm)	Test duration (minutes)
	No Test	

Test method: ☐ Pump ☐ Bailer ☐ Air ☐ Flowing artesian

Water Quality test or comments: ____

13. LITHOLOGIC LOG and/or repairs or abandonment:

Bore Dia. (in)	From (ft)	To (ft)	Remarks, lithology or description of repairs or abandonment, water temp.	Water Y	Water N
10"	0'	2'	brown top soil		X
10"	2'	10'	brown sandy clay		X
10"	10'	18'	brown clay		X
6"	18'	36'	grey sand	X	
6"	36'	41'	brown sandy clay		X
6"	41'	52'	brown gravel & sand	X	
6"	52'	54'	tan clay		X
6"	54'	62'	light brown sand		X
6"	62'	65'	light brown sand	X	
6"	65'	75'	tan sand & clay		X
6"	75'	80'	brown clay		X
6"	80'	85'	light brown clay w/sand strips		X
6"	85'	100'	light brown sandy clay		X

RECEIVED DEC 19 2011 WATER RESOURCES WESTERN REGION

SCANNED DEC 19 2011

Completed Depth (Measurable) 82

Date: Started 11-17-2011 Completed 11-17-2011

14. DRILLER'S CERTIFICATION

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name DownRight Drilling & Pump,Inc Co. No. 637

*Principal Driller [signature] Date ____

*Driller [signature] Date ____

*Operator II ____ Date ____

Operator I ____ Date ____

* Signature of Principal Driller and rig operator are required.